

arrived in these parts of space. A search for this body with the aid of Prof. Winnecke's sweeping ephemerides is desirable forthwith, the length of the revolution not appearing to be determinable within very narrow limits from the observations of 1812, and there being no other recognised appearance.

IS η CYGNI A VARIABLE STAR?—Writing in September, 1842, Sir John Herschel drew attention to this star, which he said appeared to have increased very considerably in magnitude since the date of Piazzi's observations. In 1842 it was "the principal star in the neck of the Swan, and of nearly the fourth magnitude, very conspicuous to the naked eye, and making in fact the only very distinctly seizable point between *Albireo* in the beak and the bright star γ in the body."

Piazzi, who observed the star nineteen times in right ascension and eleven times in declination, calls it 6.7 m. D'Agelet had estimated it 4.5 on July 29, 1783, and 5 on September 17, 1784; Lalande, 5 on August 12, 1793, and 4 on July 14, 1797; Bessel in his zone 436 on September 8, 1828, calls it 3 m. (!); Argelander and Heis, 4.5. Thus Piazzi's estimate appears to be lower than in the case of any other modern observer, but it is to be noted that Flamsteed reckoned the star no higher than the sixth magnitude.

η Cygni seems to deserve some attention at the hands of observers of the variable stars.

GEOLOGICAL NOTES

GEOLOGY OF BELGIUM AND THE NORTH OF FRANCE.—M. Moulon of Brussels has just published a work devoted to the general geology of Belgium. It describes the formations in chronological series, and is illustrated with maps, sections, and plates of the microscopic structure of rocks. A useful feature in it is a full bibliography of Belgian geology brought up to date. The new Government Geological Survey of Belgium has just published three sheets of maps, with sections, and explanatory notices. The maps, on a scale of $\frac{1}{250,000}$, are printed in chromolithography and on a novel plan. The ordinary topographical features—roads, fences, trees, houses, &c., are printed in different colours, according to the tertiary formation lying underneath. Thus the Wemmelen (Eocene) areas are at once recognisable by an orange topography, the Oligocene tracts by one in slate colour and the Anversian (Miocene) by one in crimson. The quaternary deposits overlying these formations are expressed by broad tints of colour. The maps are accompanied by "Notices Explicatives," which in the case of the Hoboken and Contich sheets appear as a well-printed 8vo pamphlet of 256 pages, and a sheet of superficial sections on a scale of $\frac{1}{100,000}$ for length and $\frac{1}{20,000}$ for height. The country delineated, and described lies on the low ground drained by the Escaut and Rupel, where, as little can be seen at the surface, a large series of borings has been made. The work has been accomplished by the Baron O. van Erborn, with the co-operation of M. Cogels. Prof. Gosselet of Lille has just issued the first fasciculus of an essay on the geology of the North of France and the neighbouring regions. It deals with the palaeozoic formations, and is accompanied with an atlas of plates of fossils, maps, and sections. No one is so competent as M. Gosselet to describe the older formations of that district which he has so sedulously studied for many years. His volume will be welcomed not only by students in Belgium and the North of France, but by geologists in other countries, who will find in it an admirable *résumé* of all that is known on this subject up to the present time, and references to the more important original memoirs where fuller information can be had.

THE RIGHT OF PRIORITY IN PALAEOLOGICAL NOMENCLATURE.—M. Gosselet, in a communication to the Société Géologique du Nord, calls attention to the great inconveniences which arise from the multiplication of names for the same species. He suggests the establishment of an international tribunal for judging of the value of each new species, and for registering it, with its name and the exact date of its publication. He thinks that the expenses of the journal of such a commission would be easily met by the subscriptions of scientific men, and that the duties of the commissioners would not be heavy, as they would need to be consulted only occasionally in doubtful cases, the ordinary routine work being performed by a secretary. As illustrations of the evils of the present system, or, rather, want of system, he cites the history of some Spirifers.

GEOLOGICAL SURVEY OF NEW JERSEY.—Mr. George H. Cook, State Geologist of New Jersey, has issued his unpretend-

ing but useful Annual Report for 1879. It contains a record of the development of the mineral industries of the State for last year, and is accompanied with a good map, on which are delineated the various soils as distributed over the area. The iron-bearing rocks of the Archean series extend from the north across New Jersey, and for several generations iron has been worked in this State. It is chiefly magnetic ore, and is searched for by means of the compass-needle, the attraction of which is noted. The commercial depression which began in 1873 has told heavily on the iron manufacture in the State. Of 200 mines and localities for ore only thirty have been kept in operation during the whole period of depression. There are now hopeful indications however of a revival of the trade. In the midst of information about building-materials, soils, mines, water-supply, and other topics, the writer of the Report continues to find a place for occasional interesting geological facts. His chapters are likely to be of much service to his fellow-citizens, who, it is pleasant to learn, show their appreciation of these Annual Reports, of which many of the former volumes are out of print.

GEOLOGICAL SURVEY OF ALABAMA.—The Geological Survey of this State is very modestly equipped. Its director, Prof. Eugene A. Smith, issues Annual Reports, which show, as minutely as the resources at his command will allow, the geological structure and economic resources of the different counties of the State. But he cannot make bricks without straw. It is short-sighted policy to require a Geological Survey to be made, and to equip it so economically that it cannot efficiently perform its work. In a country where the mineral resources remain in great measure undeveloped, it would be a wise expenditure of public funds to furnish means for making cuttings or borings where the crop of a seam of coal or vein of ore might be revealed at a short distance below the surface.

CENTRAL ASIAN GEOLOGY.—We find in the last number of the *Izvestia* of the Russian Geographical Society information as to the geological structure of the tracts to be crossed by the Southern Central Asian Railway. Altogether it is a flat and dry desert, covered with recent alluvial formations; the land becomes hilly only in the Mugojar Mountains. At Orenburg, and as far as Mertvyia Soli, there appear Trias sandstones and clays, which cover the Permian limestones, and gypsum with salt-springs (Sletskaia Zashchita). In the neighbourhood of Khanskiy Post we find a formation which probably will have an importance for the railway, namely, the Jura, which contains coal. At Ak-tube the shores of Teres-byutak, Yakshi, and Djaman-kargal Rivers are craggy, and consist of Permian and Trias rocks. The Mugojar Mountains are formed of pretty green and red jades, and the Djaman-tau Mountains of an augitic porphyry of syenite and granite; gneiss and mica-slate cover the granite on the eastern slope. A kind of fine white clay, being a product of the trituration of rocks, is found at the foot of the Mugojar Mountains on both slopes, and large accumulations of gravel in the form of mounds appear at a short distance from the mountains to the east. The Karakorum steppe affords a series of mounds of sand mostly covered with vegetation and often with very old trees. These mounds are usually motionless, only those which are quite devoid of vegetation (such being exceptional) are set in motion during heavy storms. Altogether the structure of the steppe appears thus: At the base a sandstone, probably Tertiary, horizontally stratified; above this, a clay with gypsum borrowed by former watercourses, and above it the sandy mounds. Water is found at a small depth. Sandstone and clays forming low elongated terraces, and belonging possibly to the Jurassic formation, appear in the neighbourhood of Kara-tougay on the Syr-daria River.

GEOLOGY OF GENEVA.—The Geological Map of the Canton of Geneva, on the scale of 1 to 25,000, together with a "Geological Description of the Canton," in two volumes, by Prof. Alphonse Favre, have been published under the auspices of the Geneva Agricultural Society—the map a year ago, and the "Description" only now. The map is well printed with eight colours very agreeable to the eye, and sufficiently transparent not to obstruct the topographical details. As to the geological value of this work, the name of M. Favre is a sufficient warrant. The learned professor has spent no less than twenty-seven years in the study of the formations of his Canton. The "Description" consists of four parts. The first gives general notions in geology; the second contains a detailed description of the formations of the Canton, namely, the Molasse, the glacial and the post-glacial deposits

with numerous analyses of soil which give to this part a great importance for agriculture. The third part deals with erratic blocks as to their composition and origin; the fourth part describes subsoils, and contains a description of Lake Leman.

JURASSIC ROCKS OF THE ALTAI MOUNTAINS.—According to the researches of M. Schmalhausen, noticed in the *Memoirs (Troudy)* of the St. Petersburg Society of Naturalists, vol. x., the fossils of the Kouznetsk Carboniferous basin in the Altai Mountains, which fossils were described until now as palæozoic by Göppert in Tchikhatcheff's "Travels," by Eichwald, and by Heinitz in Cotta's "Altai," are identical with the Jurassic (Bathonian) plants which Heer has recently described in the Jurassic Flora of Eastern Siberia and Amour. M. Schmalhausen describes them as *Phyllothera*, *Asplenium whitbense tenuis*, *Pterophyllum inflexum*, *Podocarpites lanceolatus*, Lindl., *Brachyphyllum*, and *Czekanowskia rigida*, Heer.

MIOCENE FLORA.—In his work, "Die Miocene Flora von Sakhalin," just published by the St. Petersburg Academy of Sciences, Prof. Schmidt describes 74 species of plants he has discovered, of which 43 were formerly known in other countries, and 31 are new; 27 are identical with Arctic Tertiary plants, 25 with Swiss, 18 with those of Alaska, and 21 with those of North America. The eighteen Alaska species are the most common of the Sakhalin Miocene flora, which circumstance, as well as the intermediate characters of the Tertiary flora of Kamchatka, is a new argument in favour of Asia, having formed, with America, one continent at this geological period. It is important to observe that the Tertiary flora of Sakhalin has more likeness to that of Greenland, of Spitzbergen, and of Switzerland, than to that of Central Siberia; thus, out of the eighteen species of Tertiary plants discovered by M. Lopatin on the banks of the Choulum River (not far from Krasnoyarsk), none were found among the Miocene fossils of Sakhalin, whilst the Tertiary flora of the southern shores of Lake Baikal is very like that of Sakhalin and of Alaska. To explain these differences Prof. Schmidt supposes that the fossil plants which are all described by Heer as Miocene ought to be considered as belonging to an older substage, all the more that the Sakhalin plant-beds are very intimately connected with the marine chalk which they concordantly cover.

CHEMICAL NOTES

THE influence of sewage on potable waters is again being discussed. Herr R. Emmerich—in *Bied. Centralblatt*—makes an original contribution to the subject. He has for a long time daily drunk from a half to one litre of water from one of the Munich brooks which receives sewage of every kind; he has satisfied himself that there were cases of typhoid in some of the houses which drained into the brook. No bad effects having followed the consumption of this beverage, Herr Emmerich invites other experimenters to pursue investigations similar to his own! The same observer, however, finds that sewage water produces death in rabbits when injected subcutaneously in quantities of from 6 to 60 c.c., rabbits of a similar size being killed by the injection of 200 c.c. of distilled water. The injection of the residue from the evaporation of 500 c.c. of sewage water produced strong convulsions and death in rabbits. He proposes that suspected water may be examined by injecting 40 to 80 c.c. under the skin of a full-grown rabbit; if no rise of temperature greater than 1° occurs, or if death does not quickly follow the injection, the water would probably be unobjectionable to human beings drinking it.

CITRIC acid has been formed synthetically by Grimaux and Adam. The process, which is described in the *Comptes rendus*, consists in forming dichloroacetic acid $\text{CH}_2\text{Cl}-\text{COH} \begin{smallmatrix} \text{CO}_2\text{H} \\ \text{CH}_2\text{Cl} \end{smallmatrix}$ from symmetrical dichloroacetone, itself produced from glycerin through the intermediate stage of dichlorohydrin. By saponifying, by means of hydrochloric acid, the sodium salt of dichloroacetic acid, citric acid is produced; this synthesis confirms the generally accepted structural formula of citric acid.

DOUBT as to the elementary nature of sulphur is expressed by Th. Gross because of recent experiments wherein he claims to have produced a black, nonoxidisable, chemically indifferent substance by heating perfectly pure sulphur with linseed oil, dissolving the product in sulphuric acid, and precipitating by sulphuretted hydrogen.

THE influence of very small quantities of foreign substances in modifying processes of chemical change is a subject of much interest to the chemist, although as yet no full explanation has been given of this class of phenomena. In the course of his researches at high temperatures Victor Meyer has given one or two instances of such reactions. Thus he finds that ferric chloride, aluminium chloride, and zinc chloride are decomposed with evolution of chlorine at much lower temperatures when the vapour-density apparatus is previously filled with nitrogen gas than when no foreign gas is present. Meyer cannot trace any connection between the temperature, or amount of decomposition, and the chemical nature of the foreign gas.

THE long-protracted discussion between Berthelot and Wurtz regarding the dissociation of the vapour of chloral hydrate appears at length to be closed; Berthelot admits in the *Comptes rendus* that the vapour is partly dissociated at 100°, and that if the pressure is small the dissociation is probably complete.

AN interesting experiment, and one likely to lead to further results, is described by Berthelot in the *Comptes rendus*. He finds that such unstable compounds as ozone, hydrogen peroxide, &c., are not affected by sonorous vibrations of the rapidity of 100 and 7,200 per second.

M. MEUNIER claims, in *Comptes rendus*, to have produced spinel crystals, and thinks he has also produced periclase and corundum by the action of steam on aluminium chloride, at a red heat, in presence of magnesium.

AMONG other results accruing from V. Meyer's recent determinations of vapour densities is the addition of six or eight substances to the small list of gaseous metallic compounds. From the densities, and analyses, of these compounds the following numbers may be deduced as representing the *smallest possible valency* of the element placed opposite each number:—Arsenic, 2; cadmium, 2; copper, 2; iron, 4; indium, 3; tin, 2; zinc, 2. The formula of stannous chloride is shown by Meyer to be Sn_2Cl_4 at about 700°, but SnCl_2 at 900°. Hence the valency of tin varies at different temperatures.

IN the last number of the *Berliner Berichte* an attempt is made by Wiebe to trace a connection between the atomic weights of elements and the molecular weights of carbon compounds, and the coefficients of expansion of the same substances. He shows that for many elements the ratio between the reciprocal of the number obtained by multiplying the atomic weight of an element into the mean coefficient of cubical expansion from 0° to 100°, and the heat required to raise unit weight of the same element from absolute zero to the melting-point, is a nearly constant number. For elements crystallising in the regular system the mean value of the constant is 2.6; other elements show considerable divergences. For certain classes of carbon compounds the following equation is shown to hold: $\frac{A \cdot \alpha}{d} \cdot T = n \cdot \text{const.}$, where

A = molecular weight, α = mean cubical expansion from 0° to 100°, d = density of liquid compound, T = absolute boiling-point, and n = number of atoms in the gaseous molecule of the compound. The constant for the fatty acids and ethereal salts is from 3.1 to 3.8.

IN the *Proceedings* of the Asiatic Society of Japan R. W. Atkinson gives the results of his analyses of several Japanese porcelain clays; these results show that the opinion of H. Wurtz, viz., that Japanese porcelain is prepared from decomposed felspathic rocks alone, without admixture of kaolin, is not generally correct. Many of the clays analysed by Atkinson contained from 54 to 59 per cent. of silica, with 26 to 32 per cent. of alumina; others again contained from 73 to 79 per cent. of silica. In the clays exhibited in the Philadelphia Exhibition Wurtz found only one containing less than 74.5 per cent. of silica.

IN a series of papers by Nilson, and by Nilson and Pettersson, in the last number of the *Berliner Berichte*, important additions are made to our knowledge of the rarer earth metals. The existence of ytterbium seems proved. The atomic weight of this metal is 173 (mean of seven closely-agreeing determinations), assuming the formula of the oxide to be Yb_2O_3 . The chief reasons for this formula are the isomorphism and general analogy of the sulphates of ytterbium, erbium, and didymium; the close analogy between the selenite of ytterbium and the selenites of metals which form oxides of the formula M_2O_3 , and the molecular heat and molecular volume of Yb_2O_3 compared with the same constants for the group M_2O_3 .